

PEACE OPERATIONS: IS THERE A NEED FOR WHEELED ARMORED VEHICLES?

**A MONOGRAPH
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First Term AY 96-97

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19970505 178

DTIC QUALITY INSPECTED 1

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)

3. REPORT TYPE AND DATES COVERED
MONOGRAPH

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

**8. PERFORMING ORGANIZATION
REPORT NUMBER**

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

**10. SPONSORING/MONITORING
AGENCY REPORT NUMBER**

12a. DISTRIBUTION / AVAILABILITY STATEMENT

12b. DISTRIBUTION CODE

SEE ATTACHED

15. NUMBER OF PAGES

16. PRICE CODE

19. SECURITY CLASSIFICATION OF ABSTRACT

UNCLASSIFIED

UNLIMITED

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Michael J. Clidas, MA


Title of Monograph:

Peace Operations: Is There a Need for Wheeled Armored Vehicles?

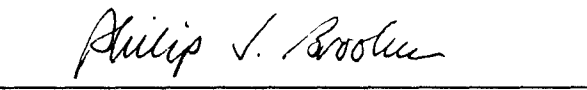
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Accepted this 20th day of December 1996

ABSTRACT

As the world's strategic environment continues to change, the need for forces trained and equipped to conduct peace operations increases. The United States recognizes that the maintenance of peace and stability throughout the world supports its national interest; therefore, its armed forces must remain capable of participating in such operations. It is imperative that the U.S. Army trains and equips its forces to meet the unique challenges presented by peace operations.

The United States Army is one of the last armed forces in the world to fill the void that exists between its wheeled and tracked armored vehicles. Units participating in peace operations utilize either the High Mobility Multi Purpose Wheeled Vehicle (HMMWV), the M2 Bradley Fighting Vehicle, or the M1A1 Tank. The lack of a wheeled, light armored vehicle alternative requires our forces choose between a highly mobile system which provides minimal firepower and no protection, or vehicles that provide superior protection and firepower at the expense of mobility.

This monograph examines the unique capabilities offered by light, wheeled armored vehicles, and will attempt to determine if these vehicles are uniquely suited for use by forces conducting peace operations.

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... we must prepare our forces for peace operations to support democracy or conflict resolution. The United States, along with others in the international community, will seek to prevent and contain localized conflicts before they require a military response ... combat units are less likely to be used for most peace operations, but in some cases their use will be necessary or desirable. ...¹

National Security Strategy of the United States, 1995

I. INTRODUCTION

As the Special Representative of the United Nations Secretary General in Haiti observed, the new world order is a place where it is unlikely that the nations of the world will employ their armed forces in traditional international combat. Instead, the future will see these forces engaged in intra-national conflict to restore stability and order.² The United States' view on peace operations is that U.N. peacekeeping contributes to the national security strategy. For the United States, the maintenance of peace and stability through peace operations is key to protecting its economic, political, and humanitarian interests.³ As Ambassador Madeleine K. Albright noted in testimony before the Subcommittee on Foreign Operations, U.N. peacekeeping operations help "defuse crises and prevent breaches of peace from turning into larger disasters."⁴ Noting casualties sustained in Yugoslavia, Somalia, and Cyprus, Ambassador Albright emphasized that contrary to popular misconception, many U.N. peacekeeping operations are neither consensual nor risk-free.⁵ Peace operations are occurring with an ever increasing frequency, and the future shows no sign that this trend will lessen. Our nation's armed forces must be prepared to respond to the challenges that peace operations pose.

In view of the U.S. policy on peace operations, the U.S. Army can expect to play a key

role in future operations. The mission of the United States Army, is to be prepared to "deploy forces rapidly and sustain them in combat and noncombat operations with appropriate force structures, weapons, and doctrine."⁶ Thus, it is imperative that the U.S. Army remains structured and equipped to meet the threats inherent in peace operations, because U.N. peacekeeping operations often serve to prevent local disputes from escalating into more violent conflicts.⁷ Many note that the internal composition of a peace operation, to include the organization, command and control, and arms and equipment of the force can affect the overall success of the operation.⁸ More than just the issue of force protection must be considered when selecting a vehicle for the peacekeeping force. This monograph will attempt to identify the armored vehicle best suited for the U.S. Army in support of peace operations. Due to its limited scope, the monograph will specifically focus on the unique capabilities offered by light, wheeled armored vehicles in a peace operation environment.

RESEARCH METHODOLOGY

The key question this paper seeks to answer is "are wheeled, light armored vehicles uniquely suited to the peace operations environment?" The monograph will make use of After Action Reports, Center for Army Lessons Learned documentation, and the experiences of various foreign countries in peacekeeping operations. The key criteria that the monograph will use to reach conclusions concerning the utility of wheeled light armored vehicles will include mobility, protection, and firepower. Using these criteria, and the experiences of selected armed forces, the monograph will attempt to identify some conclusions concerning the utility of such vehicles in peace operations.

This study will use the following methodology: (1) Define peace operations based on current U.S. doctrine and independent studies; (2) identify some factors that influence the application of force in peace operations; (3) identify some unique environmental factors that have an impact on peace operations; and (4) evaluate the capability of wheeled, light armored vehicles to meet these operational requirements.

For the purposed of this paper, wheeled, light armored vehicles are those vehicles that normally weigh from 8000 kg to 25,000 kg. Typically using four to eight wheels, their armor normally consists of high hardness rolled homogeneous steel, ceramics, kevlar, or a combination of the three. Their weapons systems range from 7.62mm machine guns to 105mm cannons. Used by many nations in a variety of roles, these vehicles have proved their suitability throughout a wide range of environmental extremes.⁹ To limit the scope of this study, the vehicles that will be examined include the U.S. Army's M1025/26 High Mobility Multi Purpose Vehicle (HMMWV), the Canadian Land Forces Cougar, the U.S. Marine Corps' LAV-25, and the South African Defense Force's AFV 76 ROOIKAT.

While this monograph will primarily focus on lessons learned from past peace operations, it will also make use of lessons learned by the South African Defense Force (SADF) concerning their use of wheeled armored vehicles for internal security missions. Although the South African experience during the last 20 years is one of Low Intensity Conflict (LIC), lessons learned in this environment have utility in this study. The generally accepted definition of LIC views it as "armed conflict for political purposes short of combat between regularly organized forces."¹⁰ It may also include a counterinsurgency campaign in which a regular armed force pits itself against guerrillas or irregulars. Included in this definition are armed insurgencies in which

a regular armed force is engaged against guerrillas, and/or acts of terrorism. Thus, lessons learned in the LIC environment offer insights that are also applicable for the use of armored vehicles in a peace operations environment.¹¹

This paper is structured in the following manner. Following the introduction, Chapter II will examine the restrictions, limitations, and impacts of the application of force in peace operations. Specifically, the study will focus on the applications of force in both peacekeeping and peace enforcement operations. A fundamental premise of this monograph is that the injudicious or ill conceived use of force can adversely affect the outcome of a peace operation; therefore, the weapons armies use to apply force can contribute to the overall the success or failure of the operation. Thus, a basic understanding of how military force affects such operations is essential. Current U.S. Army doctrine and associated studies will provide the material for this inquiry.

Chapter III will analyze the physical challenges that an armed force encounters when conducting peace operations. To limit the search for examples of such challenges, the study will focus on physical factors that affected peace operations in Haiti, Somalia, and the Former Republic of Yugoslavia. Factors which will be reviewed include typical missions, the physical environment, road networks, and the threat encountered by armed forces within the respective theater.

Chapter IV will review the various light, wheeled armored vehicles presently used in peace operations. This review will provide technical overviews in an attempt to assess the weaknesses and advantages of each respective system. Observations concerning the performance of these vehicles in various peace operations will also be included.

Chapter V will provide the reader with an assessment of the advantages and disadvantages of light, wheeled armored vehicles in a peacekeeping environment. The criterion we will use to evaluate the effectiveness of these vehicles includes mobility, protection, and firepower. Additionally, the review will include an assessment of how well these vehicles meet the unique political and psychological challenges peace operations impose on the application of force.

Finally, Chapter VI will provide conclusions and recommendations concerning future uses of wheeled, light armored vehicles in peace operations.

BACKGROUND

The U.S. Army is among the most modern military forces in the world; yet it has failed to adequately address what many view as a critical gap between its light unarmored utility vehicles (HMMWVs) and the lightest of its tracked armored vehicles (M113 and Bradley).¹² While the U.S. Army currently lacks a wheeled, light armored vehicle, it has turned to such vehicles in the past to facilitate the accomplishment of selected missions.

Several times during the past 50 years, the U.S. Army has recognized and responded to the need for a wheeled, light armored vehicle. World War II saw the hasty development and fielding of the M8 Greyhound. The Army used the Greyhound in both offensive and security missions. Later, in Vietnam, the Army used the V100 Commando for patrols, rear area security, and convoy escort.¹³ After each conflict, the Army elected to remove these vehicles from service, even though they successfully provided a unique blend of firepower, battlefield mobility, and protection.¹⁴

Today, several nations conducting U.N. peace operations use wheeled, light armored vehicles. These vehicles are strategically mobile, and have proven to be highly effective under a variety of conditions. These nations have learned that

Tracked vehicles are not suited to IS [internal security] operations for a number of reasons. They are difficult to operate and maintain, they are noisy, they cause damage to roads and, most important of all, they are classified as tanks by the layman.¹⁵

Often called Armored Security Vehicles (ASV), the U.S. Army is again recognizing the utility of wheeled, light armored vehicles in effectively executing a variety of missions.¹⁶ These vehicles may provide the U.S. Army with the capability it needs to better meet the needs of peace operations in the 21st century.

II. THE APPLICATION OF FORCE IN PEACE OPERATIONS

To fully evaluate the utility of wheeled, light armored vehicles in a peacekeeping environment, a more rigorous examination of the nature of such operations is essential. More specifically, an understanding of the application of force in a peacekeeping environment will lead to a better understanding of the advantages of wheeled, light armored vehicles. Therefore, this section will study peacekeeping, peace enforcement, and the impact that the application of military force has on both.

The U.S. Army defines peacekeeping operations as "... military or paramilitary operations that are undertaken with the consent of all major belligerent parties."¹⁷ Usually, a group of nations undertakes a peacekeeping operation "... to monitor and facilitate implementation of an existing truce agreement and support diplomatic efforts to reach a long-term political settlement. . . ."¹⁸ While missions vary, experience shows that some tasks, such as supervision and monitoring of truces and cease-fires are common to most peacekeeping operations.¹⁹ Sometimes, peacekeeping tasks may include the reestablishment of vital public and government services.²⁰

The improper or ill-conceived application of force in this environment can have undesired consequences. Peacekeeping operations are grounded in the premise that military force can often make problems worse by "prolonging and exacerbating conflicts without resolving its underlying structure."²¹ The application of force can often embitter belligerent parties, or worse yet, reinforce lingering insecurities that can affect compliance with previously agreed upon terms.²² U.S. Army studies reinforce this point. In a recent white paper addressing

Military Operations in Urban Terrain (MOUT) and peacekeeping, the U.S. Army stressed that "Peacekeeping forces and observers do not employ violence, except in self defense."²³ Such restrictions on the applications of force differ from those found in conventional operations because they demand a higher level of flexibility from the peacekeeping force. The organizational structure, level of training, and type of equipment must allow the force to conduct operations in an environment that eschews the use of force. U.S. Army forces conducting peacekeeping operations must ". . . be adaptable and adjust their operations to the situation."²⁴ Clearly, the application of force in peace operations demands a high degree of restraint.

The U.S. Army defines peace enforcement as ". . . the application of military force or the threat of its use, normally pursuant to international authorization, to compel compliance with generally accepted resolutions or sanctions."²⁵ The objective of peace enforcement is the restoration of peace and stability to establish the conditions necessary for a negotiated, long term settlement.²⁶ Peace enforcement is a form of combat. It is most often characterized by armed intervention, or the threat of intervention. Seldom planned or executed unilaterally, peace enforcement operations are conducted pursuant to international mandate. The white paper emphasizes "The primary purpose of peace enforcement is the maintenance or restoration of peace under conditions broadly defined by the international community."²⁷

Measured and judicious application of force is a key element of any peace enforcement operation. While a peace enforcement operation is not the equivalent of a United Nations Chapter VII action, it does refer to operations characterized by large scale destruction and bloodshed.²⁸ In contrast to collective security operations (e.g., the Gulf War), loosely organized and poorly equipped belligerents are often key actors in a peacekeeping operation.²⁹ As one

observer notes:

... the use of force in UN military operations ... demand(s) more than traditional consensual, impartial, and non violent peacekeeping, but require(s) less than 'Gulf War' type operations against large state armies.³⁰

The intent of a peace enforcement operation is not to obtain a party's unconditional surrender. In accordance with its international mandate, a force engaged in peace enforcement sets "a clear boundary on acceptable conduct, penalizing parties which wantonly breach those boundaries, and then re-incorporating the parties back into the peace process."³¹ In successful peace enforcement operations there is a clear and proportionate linkage between the offensive use of force, and those actions committed by belligerents.

Typically, peace enforcement operations confront the force with missions that call for the forcible separation of hostile factions or belligerent parties. Rather than using traditional tactics that seek the destruction of an armed opponent, units conducting peace enforcement operations must use constant and relentless pressure to separate the belligerents.³² The U.N. authorizes the use of force to resist attempts by belligerents to disrupt the force from conducting operations in accordance with the U.N. mandate. This presents forces involved in peace enforcement with a unique dilemma. As one observer notes

UN forces in peace-enforcement operations must walk a fine line: they must deploy with and even use force on a much greater scale than what traditional peacekeepers wield, without threatening the parties or exacerbating hypersensitive fears about group-extinction.³³

Because excessive application of force (including vastly superior military capabilities) can cause belligerents to strike back out of fear, the U.N.'s view is one that severely restricts its application.³⁴

In contrast to the application of force in conventional military operations, the use of force in peace operations (both peacekeeping and peace enforcement) is severely restricted. The force commander must have a clear vision of the desired political endstate, and how to deal with factions that may not share the same vision. The U.N.'s belief is that

... only a political process can determine the effectiveness of a peacekeeping operation. Heavily armed peacekeepers make their acceptance by the parties more difficult, and heavy armaments offer dangerous opportunities and temptations in the hands of less cautious officers.³⁵

The U.N.'s view on the application of force in peacekeeping operations is far from unanimously accepted. Another perspective maintains that execution of nonviolent peace operations often fails because the belligerents want it to fail. Many point to recent experiences in Cambodia, Angola, Somalia, and the former Yugoslavia to support the case that overwhelming force does have a place in peace operations.³⁶ For instance, peacekeepers may need to be apply offensive force to provide an acceptable level of security for the force. Some assert that the small number of "offensive" armored vehicles in Somalia contributed to an atmosphere that restricted the ability of the force to carry out the U.N. mandate.³⁷

Apart from these differences, there is general agreement that the improper use of force in peace operations can lead to long term failure. The ill conceived use of force can result in a protracted operation with little hope for success. The peacekeeping force must be trained, structured, and equipped to use force in a way that achieves objectives rapidly, protects the force, and avoids escalating the general level of violence.³⁸ It must deploy with sufficient force, and the requisite training to apply it judiciously.

III. Unique Aspects of the Peacekeeping Environment

While the previous chapter has examined the political and psychological factors that influence the use of force in peace operations, this chapter will examine the military and physical features unique to such environments. Such a review is necessary to better understand the unique advantages that light, wheeled armored vehicles provide the force in a peace operations environment. Closer study of the missions conducted by military forces in peace operations, along with an examination of characteristic infrastructures and threats, are essential components of such a review. Furthermore, this chapter will also analyze the impact that peacekeeping's political and psychological factors have upon military operations in this unique environment. While lessons learned from operations in Somalia, Haiti, and Bosnia provide the preponderance of material for this review, the monograph also uses lessons learned from security operations in South Africa. Any study of operations within a peacekeeping environment must, however, begin with a review of the various missions associated with both peacekeeping and peace enforcement.

Military Missions

Units engaged in peacekeeping operations can typically expect to conduct one of three missions. They are (1) supervise, observe and monitor cease fires and truces, (2) conduct reconnaissance and surveillance, or (3) investigate complaints and violations of the provisions of an agreement. As previously discussed in Chapter II, the use of force during peace operations is very restricted; it is usually limited to self defense.³⁹

Units engaged in peace enforcement operations can normally expect to conduct

operations that fall into one of the following six broad categories. These include (1) restoration and maintenance of order and stability, (2) protection of humanitarian assistance, (3) guarantee and denial of movement, (4) enforcement of sanctions, (5) establishment and supervision of protected zones, and finally, (6) forcible separation of belligerents. As already noted in Chapter II, the use of force in peace enforcement operations is less restrictive than in peacekeeping operations. In general, units involved in peace enforcement apply force to compel or coerce.⁴⁰

Experience shows that military forces conduct certain tasks with a high degree of frequency in both peacekeeping and peace enforcement. Such tasks often include route and area reconnaissance, mobile patrolling, and security of designated convoys. Lessons learned during numerous peace operations suggest that units conducting reconnaissance and surveillance operations must be capable of on and off road mobility over all types of terrain. When conducting mobile patrols, units can normally expect to orient on major supply routes (MSR's) or around critical facilities. If required to restore order and maintain stability within the context of a peace enforcement operation, military forces will often find themselves preventing looting and other acts of violence.⁴¹ Armored and mechanized forces can provide a peacekeeping force with advance guards, convoy security, and quick reaction force capabilities. Additionally, they can provide supporting fires at checkpoints and roadblocks.⁴²

Operations in Haiti during Operation Restore Democracy provide many examples of the tasks performed by lightly mechanized units in a peacekeeping environment. For example, in Haiti, military forces had the mission to maintain a "secure and stable environment for the newly formed democracy."⁴³ As a unit participating in Operation Restore Democracy, the 2d Armored Cavalry conducted various missions that fall into one of the broad categories already discussed.

Mounted in its M1025/26 HMMWVs, this light cavalry unit conducted patrols, provided both fixed site security and quick reaction forces and secured convoys for various non-government organizations (NGO).⁴⁴

Convoy security is another task that plays a prominent role for forces engaged in peace operations. Experiences in many peace operations demonstrate that an armor heavy advance guard should escort most convoys. Typically, the role of such a force is to defeat mines, detect ambushes, and deter attacks. Additionally, experiences suggest that forces conducting such tasks should consider integrating light vehicles into their advance guard. These vehicles should be armed with weapons that can deliver precise fires with minimal collateral damage.⁴⁵ Ideally, convoy security elements should consist of one or more squads, mounted in vehicles capable of keeping pace with the main body. While most convoys move along improved or unimproved roadways, security vehicles should be able to operate both on and off the roadway. An off road capability is desirable to facilitate scouting ahead of the main body, and to defeat potential ambushes along the convoy route.⁴⁶

In addition to convoy security, another important task for forces engaged in peace operations is patrolling. As in Haiti, United States Army Europe (USAREUR) elements operating in the Former Yugoslav Republic of Macedonia conduct numerous patrols. As one U.S. officer in Macedonia noted, "patrolling supported accomplishment of the mission and provided a vehicle for showing our presence to the local citizens on a daily basis."⁴⁷ In Bosnia, elements of the 18th Military Police Battalion still conduct patrols to assure area and route security and enforce law and order.⁴⁸ However, the force must accomplish its patrolling mission in a way that balances military requirements with the goal of reducing damage to limited

infrastructures. One leader observed, "Certainly the civilian population would have been displeased had we destroyed their already limited infrastructure, not to mention a rapid inability to supply our own operations along these same fragile supply lines."⁴⁹ While damage to road networks and bridges may be deemed acceptable in conventional military operations, it is counterproductive in peacekeeping operations.

Patrolling achieves a psychological benefit as well. As often happens, forces engaged in peace operations deploy into areas racked by violence. In such areas, the mere presence of a professional military force conducting a patrol can have a stabilizing effect. As one U.S. Army study noted, the population's attitude can affect the success of the peacekeeping mission. Similarly, the same study noted that forces which present themselves in an overly warlike manner can have the opposite effect. Simply stated "soldiers with camouflaged faces do not steady the populace."⁵⁰

Clearly, there is an additional set of factors that must be considered when employing military forces in a peacekeeping operation. Peacekeepers must develop Rules of Engagement (ROE) which govern how they will apply force, which systems they will use, and what procedures they will use to minimize collateral damage. As Dr. Larry Cable noted:

This does not mean that combat forces, both air and ground, do not play a critical role in interventionary peace operations nor that killing must be avoided at all costs, but rather both killing and the employment of lethal military assets are governed by rules, limitations, and constraints not found in conventional interstate war.⁵¹

For instance, Canadian forces operating as part of the United Nations Protection Forces (UNPROFOR) in Bosnia-Herzegovina used the COUGAR fighting vehicle. As operations progressed, the Canadians came to the conclusion that both political and military considerations

would not permit them to employ the Cougars' 76mm main gun. First, the 76mm gun would be a disproportionate response to the sniper fire they received from the belligerents. Additionally, the collateral damage that a 76mm gun engagement would inflict upon surrounding structures could not be justified. The only alternative to the 76mm gun was the Cougar's turret mounted machine gun; however, the inaccuracy of that weapon reduced its effectiveness as a counter-sniper weapon.⁵²

The counter-sniper requirement is but one of many force protection issues that forces engaged in peace operations must address. The commander of a peace operation must often extend protection to non-government organizations, and various other organizations working within the area of operations.⁵³ The force commander faces a difficult problem; not only is he required to protect his own force and the personnel of various other organizations, but he must do so in a manner that considers the political and psychological factors unique to the peacekeeping environment. The image of a tracked combat vehicle accompanying relief workers may evoke the emotions that the force should strive to avoid.

Civilians often classify tracked vehicles such as the M2 as tanks. As many writers have observed, tanks send a psychological message that is not suited to effective peace operations. As one analyst noted, "... all tracked vehicles are commonly confused with tanks and can be branded, therefore, in a highly emotive way, as instruments of oppression. . . ." ⁵⁴ Indeed, the U.N. prohibited the Canadians from deploying to Bosnia with "tanks" because of the political message such vehicles would send.⁵⁵

In the U.S. Army, the M2 Bradley has replaced the M113 armored personnel carrier as the standard vehicle of mechanized infantry forces. The M2 proved to be a capable infantry

fighting vehicle during the Gulf War; however, within a peace operations environment the M2 has many of the drawbacks typical of armored personnel carriers. Although it has a two man turret equipped with a 25mm chain gun and TOW system, it is in many respects similar to an armored personnel carrier in weight, and overall appearance.⁵⁶ Because of the images evoked by tracked vehicles, its use could be counterproductive to the long term goals of a peace operation. Obviously, the capabilities and limitations of an armored vehicle, and the impact its use will have on the success of a peace operation, warrants careful consideration during the planning process.

Additionally, experience in many internal security operations shows that tracked vehicles are difficult to operate and maintain in the often austere peacekeeping environment. They are noisy, and often cause damage to roads in areas where the infrastructure is already limited.⁵⁷ Ironically, heavy tracked vehicles can cause damage to the few roads over which their repair parts must travel.

These and other factors should cause military planners to carefully consider the type of vehicle their forces will use in a prospective peace operation. Planners must always remember that the endstate for most peace operations is to "create or support conditions conducive to a negotiated conflict resolution."⁵⁸ Clearly, it is counterproductive to utilize a vehicle that further destroys an already weak infrastructure, and can contribute to the destabilization of an environment in which stability is a part of the desired endstate.

Physical Characteristics of the Peace Operations Environment

Experiences in the Former Republic of Yugoslavia, Haiti, and Somalia reveal many

physical similarities. All three regions presented peacekeepers with the problem of conducting operations in constricted urban areas, or undeveloped regions with imposing natural features and weak road networks. Recent projections suggest these development patterns, and the challenges they present, will continue to grow in the foreseeable future. The following section will address the impact such geographic and man made features have on peace operations.

Urban "sprawl" is not a phenomenon unique to the United States. Throughout the world, urbanization is on the rise. Some projections indicate that urban terrain in Europe may increase by 75-100% over the next 10-20 years.⁵⁹ Military operations in such terrain are often influenced by the fact that ground-level "intervisibility is generally limited to the width of streets and squares, the length of straight stretches of street, and the run of the occasional larger open space. . . Those in the streets are completely exposed to the most elementary forms of attack"60 Since such areas often have a high density of civilians, military forces must respond in a way that is restrained, and minimizes collateral damage.⁶¹

Peacekeepers operating in both Haiti and Bosnia had to contend with the stark reality of operations in such urban environments. On occasion, they had to replace their fighting vehicles' weapons systems to minimize collateral damage. In other situations they simply did not use selected systems. For example, U.S. forces operating in Haiti, capitalizing on lessons learned from operations in Mogadishu, modified their HMMWV's main weapons system. Task Force 1-87, a subordinate element of the 10th Mountain Division (LI)

. . . drew upon its Somalia experiences and tried to determine how to better equip themselves for operations in Haiti. One of the shortcomings of the battalion during this deployment was the armored HMMWV. . . Part of the mission analysis determined that MK19s would be of little use in the urban environment as rules of engagement would be restrictive. The unit decided that each HMMWV would be

armed with a M60 machine gun or M249 Squad Automatic Weapon.⁶²

As the unit soon discovered, the rules of engagement did become more restrictive in Haiti, and the MK19 was not deemed an appropriate weapon for peacekeeping operations in Port-Au-Prince.⁶³

Canadian forces operating in Bosnia with UNPROFOR also had to contend with the effect of urban terrain on the use of their vehicles' weapons system. As already noted, the Canadians determined that the Cougar's 76mm gun was not an appropriate weapon system for use in built up urban areas. As a result, they avoided use of this system whenever possible.

The experiences of both forces highlights the effect of urban terrain on military operations, and emphasizes the additional constraints imposed by peacekeeping operations in such an environment. Clearly, peace operations in urban environments are characterized by " . . . restraints on weaponry, tactics, and levels of violence." As stated in FM 100-25, Peace Operations, "the use of excessive force may adversely affect efforts to gain or maintain legitimacy and impede the attainment of both short and long-term goals."⁶⁴ Weaponry, in this case the weapons platforms, must allow the force to respond with a balanced and appropriate level of firepower should the need arise.

Notwithstanding roads in the urban areas of Haiti, Somalia, and Bosnia, road networks in the rural areas of these countries are limited. For example, while Bosnia-Herzegovina has over 21,200 km of roads, half of this total is mountain track. Significantly, there is only one all weather road in Bosnia.⁶⁵ The situation is not much better throughout the Former Republic of Yugoslavia. Commenting on the ability of the Macedonian road network to support heavy tracked vehicles, one U.S. officer said that " . . . had we been forced to use tracked M113's,

M2A2's, or M1A1's, the fragile road network never would have lasted."⁶⁶

Haiti's road network situation is even less developed: the nation has 600 km of surfaced roads, while an additional 4000 km remain unpaved.⁶⁷ While data on the roads in Somalia is vague, the Canadian experience in Somalia illustrates the effect of limited road networks on ground operations.

In Somalia, Canadian operations as part of the United Nations Task Force (UNITAF) were shaped by two key factors: ground and infrastructure. A key characteristic of the Canadian area of operations in Somalia was that travel from the main supply base in Mogadishu to the interior required vehicles to cross the flood plain of the Shebelle River. As the Canadians soon discovered, while the bridges were adequate for such traffic, the roads were not. Often, sustainment by ground transport was difficult, if not impossible. Overall, the Canadians found the wheeled Cougar well suited to operations over extended distances with limited road networks.⁶⁸ Perhaps only the violence wreaked by men would provide the peacekeepers with more challenges than those presented by the regions' infrastructure and natural features.

The threats which peacekeepers encounter usually fall into one of three categories. The first category is that of missiles such as rockets, grenades, or projectiles fired by hand held launchers. The next threat is rifle bullets fired by snipers. Finally, the last threat is mines.⁶⁹ Various nations conducting peace and internal security operations throughout the world have had to contend with these threats. This section will assess these typical threats, and the measures used to counter these threats.

Missiles such as rocks, Molotov cocktails and RPG-7 rocket propelled grenades are an ever present threat to peacekeepers. These weapons pose a significant threat to forces engaged

in peace operations, because experience has shown that peacekeepers often perform their duties in built up areas. Such areas offer little room for maneuver, and provide a wide range of opportunities for belligerents to engage the force at short range. While peacekeepers in Bosnia also operate in wooded areas, the dangers are similar: in both wooded and urban areas, vehicles are often exposed to surprise attack at very short range.⁷⁰

The sniper threat is an ever present aspect of the peacekeeper's daily routine. Snipers in Sarajevo inflicted many of the casualties sustained by peacekeepers. Whether manning an observation post, or conducting a patrol, the peacekeeper is constantly vulnerable to sniper fire.⁷¹

The sniper's bullet is indiscriminate. For example, during recent peacekeeping operations, snipers have targeted both U.S. Marines and congressional delegations in Somalia, as well as Ukrainians in Bosnia.⁷²

As experiences in Somalia and many other regions demonstrate, mines have become a weapon of choice in LIC.⁷³ Convoy escort is a key mission for mechanized elements of a force conducting peace operations; mines can prevent these units from safely completing their mission.⁷⁴ Often operating along insecure lines of communication in rural areas, wheeled vehicle convoys are particularly vulnerable to mines and ambushes.⁷⁵ Experiences in Somalia best illustrate the extent of the threat and the measures units often take, to counter the mine threat.

In Somalia, one of the primary causes of U.S. casualties was vehicular mine incidents. Mines caused approximately 26% of U.S. fatalities in Operation Restore Hope. In mine incidents involving HMMWVs, 92% of the occupants were casualties, and 50% of these were fatalities.⁷⁶

To counter this threat, U.S. peacekeepers in Somalia resorted to what the U.S. Army's Center for Army Lessons Learned (CALL) called "... primitive first generation methods of vehicular mine protection such as sandbagging and reinforcement with steel plates. . . ." ⁷⁷ The study went on to note that some HMMWVs were "... overloaded to the point that there was serious deterioration in some of the suspension components." ⁷⁸ Clearly, an alternative to the HMMWV was needed.

While the U.S. Army did in fact develop a HMMWV retrofit kit to help counter this threat, it was woefully inadequate. The HMMWV's passengers remained highly vulnerable to serious injury or death from mine blasts. Even with the retrofit kit, the HMMWV's characteristic low weight, low ground clearance, and flat bottom proved to be no match for mines which could carry up to 60 pounds of high explosives. ⁷⁹

Summary

Forces deployed to a peace operation must be equipped with vehicles and weapons systems which provide them with the capability to meet the unique challenges of the mission. They must restore and maintain stability, preserve the region's frail infrastructure, practice a high degree of restraint, and above all else protect their soldiers. Their vehicles must be highly mobile, while capable of meeting the threats characteristic of such operations. While a comprehensive study of the political, physical, and social aspects of a prospective peace operation may lead a planner to conclude that tracked vehicles are inappropriate, this may not always be the case. As Dr. Larry Cable notes:

While heavy forces such as U.S. Army armored and mechanized divisions

generally are completely inappropriate for interventionary operations, they might be the force of choice for some selected peacekeeping missions such as might occur on the Golan Heights.⁸⁰

Dr. Cable's thoughts remind us that some of the fundamentals of military planning are equally applicable when planning a peace operation. Specifically, planners must consider the mission, enemy, terrain, troops available, and time (METT-T). In peace operations the mission is normally the restoration of peace and stability to a region, not the destruction of an armed opponent. The enemy in a peace operation is the actual conflict, and not a group of belligerents. The terrain encountered in such environments is often difficult or urban, with a limited infrastructure. The troops available are often those trained for conventional operations, and the time available is frequently determined by political, not military considerations. Often, agreements drafted with the belligerent parties determine what equipment the force may deploy with. Thus, using such a methodology, and considering many of the factors already discussed, today's military planner may often conclude that heavy armored vehicles are not always an appropriate vehicle for a peace operation. However, wheeled, light armored vehicles may provide the force with the capabilities it needs to succeed in peace operations, provided they can meet the challenges of force protection (mines, missiles, and snipers).

IV. Wheeled Light Armored Vehicles Presently in Service

During the last five years, nations conducting peace operations have shown a tendency to rely upon certain vehicles for operations in such theaters. The vehicles most commonly used in such operations include the M1025/26 HMMWV, the U.S. Marine Corps' Light Armored Vehicle (LAV) - 25, the Canadian Forces' COUGAR 76mm Gun Wheeled Fire Support Vehicle, and the South African Defense Force's (SADF) Armored Fighting Vehicle (AFV)-75 ROOIKAT. Each have their own unique characteristics that warrant closer study before reaching any conclusions concerning the suitability of such vehicles in a peacekeeping role. Finally, these vehicles are representative of the wide range of light, wheeled armored vehicles in service throughout the world.

COUGAR

The Canadian Land Forces' search for a light, wheeled armored vehicle began in 1974. In June of that year, they issued a requirement for a type of vehicle classified as the Armored Vehicle General Purpose (AVGP). A study of over 14 vehicles yielded only three that the Canadian's felt were suitable. Further testing resulted in the Canadian Forces choosing the Swiss MOWAG Piranha (6x6). The first AVGP, manufactured under license from MOWAG, was delivered to the Canadian Forces in January 1976. In 1977, Canada signed a contract with the Diesel Division, General Motors of Canada Limited for the production and delivery of approximately 350 vehicles.⁸¹

Canada uses the wheeled AVGP class of vehicles in both its regular and militia units. These vehicles are equipped with an AN/VVS-501 driver's passive periscope, giving them a

night driving capability. From this basic design, the Canadians have developed three variants - the COUGAR, the GRIZZLY, and the HUSKY.⁸²

The six wheeled COUGAR is the basic Piranha AVGP fitted with the same turret system now in use on both the British Scorpion and the Australian M113A1 Medium Reconnaissance Vehicle. Armed with a 76mm L23A1 gun and a 7.62 mm machine gun, the COUGAR has a crew of three: commander, gunner, and driver. The vehicle's basic load of ammunition includes 10 rounds of 76mm and 220 rounds of 7.62mm machine gun ammunition in the turret, with an additional 30 rounds of 76mm and 3000 rounds of 7.62 stored in the hull.⁸³ This versatile vehicle is amphibious, can achieve road speeds of approximately 60 miles per hour, and has an operational range of approximately 370 miles. It has seen service with Canadian forces in both Cyprus and Bosnia.⁸⁴

While the COUGAR's performance in Bosnia was favorable, some Canadians cited its turret system as an area that warranted further improvement. Specifically, the COUGAR's non-stabilized gun was slow to respond to multiple threats that often appeared from any direction. After Action Reviews from Canadian forces in Bosnia reveal no other significant problems with the vehicle.⁸⁵ These and other experiences confirm that the COUGAR is a highly mobile system whose chief disadvantage lies in its inaccurate fire control system.

High Mobility Multi Purpose Wheeled Vehicle (HMMWV)

Another vehicle that has seen extensive service during recent peacekeeping missions (Bosnia, Somalia, and Haiti) is the HMMWV.⁸⁶ Issued to the U.S. Army in 1979, the basic M998 vehicle has undergone many modifications designed to enhance its armor protection and

organic firepower. The variant typically used by the U.S. Army in recent peacekeeping operations is the M1025/26 series Armament Carrier.⁸⁷

The U.S. Army uses the HMMWV in a variety of roles. With a gross vehicle weight of approximately 4.25 tons and width of 2.16 meters, neither urban terrain nor marginal road networks restrict its use. It is a versatile vehicle, capable of mounting a variety of weapons systems. Powered by a Detroit Diesel 150 horsepower V8 engine, the HMMWV can reach speeds of 65 miles per hour, and has an operational range of approximately 300 miles.⁸⁸ While the M1025/26 provides its four man crew with basic armor protection from fragmentation and ricochets, the armor can be upgraded to provide protection against 7.62 NATO ball ammunition.⁸⁹

The M1025/1026 HMMWV has seen extensive service with the U.S. Army in Haiti, Somalia, and Bosnia. As a HMMWV equipped all wheeled force in Haiti, the 2d Armored Cavalry Regiment (ACR), "... was capable of providing a flexible, agile, and lethal force that was capable of responding to an Operation Other Than War (OOTW) mission."⁹⁰ While the mobility that the HMMWV provided units in Haiti was certainly an asset, the limits of its armor protection gave many concern. As one After Action Report noted, "... Although maneuverable, the hardshell HMMWV is not armored enough to respond to a violent situation (and) ... The open cargo HMMWV provides no force protection."⁹¹

Because of this and other similar findings, both the U.S. Army and Air Force agreed that their forces need a vehicle that affords them a higher level of protection than the HMMWV can provide.⁹² As one U.S. Army study observed

The HMMWV, M1025/26 does not possess adequate ballistic or NBC protection.

It also lacks sufficient growth potential to allow upgrades to provide the necessary protection to permit MP teams to survive while performing their doctrinal missions. It is also deficient in the capability packages of protection and target acquisition.⁹³

The HMMWV is a highly mobile and durable vehicle. Superb maneuverability and operational range make the HMMWV an ideal choice for low threat peacekeeping operations. However, its marginal ballistic protection limits its use in areas where small arms fire is possible.

LAV-25

The U.S. Marine Corps' LAV-25 is based on the Swiss MOWAG Piranha design. An 8x8-wheeled vehicle, it meets the Marine's requirement for an air-portable vehicle capable of being used in both an armored personnel carrier or reconnaissance vehicle mode. The LAV-25's crew consists of a commander, gunner, driver. The vehicle can carry up to six troops in the troop compartment. Achieving operational status in 1984, it has seen extensive service in Marine Corps operations for the past 10 years.⁹⁴

The LAV-25's basic armament consists of a 25mm McDonnell Douglas M242 Chain Gun and a 7.62mm M240 coaxial machine gun. Both these systems are mounted in a Delco two man turret. The turret is stabilized, and the Marine Corps is replacing the original M36 day/night sight with a more capable thermal sighting system.⁹⁵

The LAV-25's basic level of armor protects against small arms and shell fragments.⁹⁶ In preparation for Operation Desert Shield, the Marines sought an armor upgrade that would allow the LAV-25 to withstand a 152mm airburst exploded at a height of 50 feet. Tests had revealed that the LAV-25's basic armor could not meet this requirement with a 75% confidence standard.⁹⁷ To meet the standard, the Marines developed the Light Applique System Technique

(LAST). LAST is a system that makes it possible to attach additional armor modules as a protective cover to the basic vehicle. Because of LAST's pressure adhesive, and a hook and loop attachment system, installation of the add-on armor is relatively easy. Neither drilling nor welding is required to install this add-on protection.⁹⁸

The LAV-25 is a highly mobile system. It can reach speeds up to 62 miles per hour with its V6 turbocharged diesel engine. The vehicle has an operational range of approximately 410 miles. The LAV-25 can also operate both on and off road, and can swim at speeds up to 6.2 miles per hour.⁹⁹ Additionally, the LAV-25 can be deployed from an aircraft using the Low Altitude Parachute Extraction System (LAPES) or the more traditional parachute drop.¹⁰⁰

The Marines used the LAV-25 for peacekeeping operations in both Haiti and Somalia. In Haiti, Marines noted that it was a highly mobile system that was well suited to operations in the congested Port-Au-Prince urban area. Furthermore, its high mobility had a psychological benefit often desirable in peacekeeping operations. As one Marine noted, "With the LAVs, their ability to move from one sector of the city to another rapidly was certainly a psychological plus that we factored into what we were going down there [Haiti] to do."¹⁰¹

In Somalia, the LAV provided Marine units with a level of firepower, protection, and mobility capable of meeting operational requirements. The ARFOR After Action Report for Operation Restore Hope noted the following:

LAVs have proved to be great for operations in MOUT environments as well as moving forces over long distances rapidly. In no way should these replace infantry units, but as a force multiplier and complimentary system they would definitely assist infantry units assigned missions such as this in the future.¹⁰²

The LAV-25 has proven to be a reliable system. Its advantages include superb mobility,

excellent protection, and an accurate fire control system. It has earned a reputation as a versatile vehicle capable of operations in a wide variety of situations.

ROOIKAT AFV-76

Developed as a result of South Africa's extensive experience in Low Intensity Conflict from 1966-1989, the ROOIKAT AFV-76 is classified by the South African Defense Force (SADF) as a weapons carrier and reconnaissance vehicle. The weapons carrier version of the ROOIKAT has a top road speed of 120 km per hour, and a top cross country speed of 50 km per hour. The basic 8x8 wheeled gun vehicle has many configurations, to include 105mm, 76mm, and 35mm gun variants. An armored personnel carrier variant can carry 12 troops and has a top road speed of 145 km/h. The 105mm variant is manufactured exclusively for export purposes. Heavier than most of the vehicles already studied, it weighs approximately 25,500 kg.¹⁰³

The ROOIKAT offers good protection against mines, small arms fire and artillery fragments. It has an operational radius over 1000 km, superb cross country mobility, and reliable firepower. The ROOIKAT's 76mm gun fires an Armor Piercing Fin Stabilized Discarding Sabot (APFSDS) round with a tungsten alloy projectile at ranges in excess of 2500m. Tests reveal that the round can defeat the armor found on both the T54/55 and T62 tanks.¹⁰⁴

The ROOIKAT's design is based on lessons learned from South Africa's 1966-1989 Border Wars. During this conflict, a combat vehicle often used by the South Africans was the Eland-90 armored car. A small, four wheeled armored car, the Eland-90 played a leading role in fighting border incursions.¹⁰⁵ Additionally, the vehicle's wheeled design provided it with a high degree of protection against mines; thus, it was often the lead vehicle in convoys along South

Africa's frontier.¹⁰⁶ Finally, the results of many operations in the vast, dry, off-road environment found in most of the country led the SADF to conclude that their fleet of Centurion Main Battle Tanks was poorly suited to operations in such an environment. As a result of their experiences during the Border Wars, most of the country's combat vehicles are now wheeled. The ROOIKAT is such a vehicle.¹⁰⁷

The South Africans utilize the Eland-90, and designed the ROOIKAT, based on their experience protecting their border from insurgents. Wheeled armored vehicles were successfully used by South Africa to cover literally millions of kilometers during the conflict.¹⁰⁸ Missions such as these, which seek to preclude infiltration of armed guerrillas or insurgents across a friendly border, are possible missions for future peacekeepers.

In a recent speech U.N. Secretary General Boutros Ghali coined the term "one sided preventive diplomacy." Operating in such a role, U.N. peacekeepers would monitor military movements across an unsecure border, possibly enforcing U.N. mandates aimed at precluding movement of certain groups across these frontiers.¹⁰⁹ U.N. forces in Macedonia are in fact conducting such missions today. The South Africans believe that these missions require a weapons platform capable of rapid operational and tactical movement in unimproved areas. They maintain vehicles such as the Eland-90 and ROOIKAT are best suited for these operations.¹¹⁰

Armored Security Vehicle (ASV)-150

The ASV-150 is the U.S. Army's newest light armored vehicle. Still in production, the Army will take delivery of the first four ASV-150s in mid-December, 1996. Designed and built

by Textron Marine and Land Systems, the ASV-150's primary user will be the U.S. Army's Military Police Corps.¹¹¹

The four wheeled ASV-150 provides the crew with all-around protection from 7.62mm NATO ball ammunition. Additionally, selected areas, (crew compartment and ammunition storage areas) are protected against 12.7mm armored piercing (AP) ammunition. The ASV also protects the crew against artillery and mortar fires, and blasts from 12 pound antitank mine.¹¹²

The ASV-150 has a one-man turret that can mount an MK19 grenade machine gun along with a coaxially mounted M2 .50 cal. machine gun. An M36E3 gunner's sight is incorporated into the turret, and provides day/night target acquisition capability. To provide additional firepower to the three man crew, an M249 squad automatic weapon can be externally mounted.¹¹³ "The ASV-150 can be fitted with a wide range of other weapons systems to meet different operational requirements."¹¹⁴

The ASV-150 possesses a high level of tactical and operational mobility. The ASV-150's wheels are "run-flat" capable, thus preventing immobilization due to small arms fire or mines.¹¹⁵ The vehicle's tactical mobility is comparable to that of the M1025/26 HMMWV.¹¹⁶ Additionally, the ASV-150 can be transported by all U.S. Air Force cargo aircraft, and U.S. Navy ships and landing craft. Furthermore, its wheeled configuration increases its ability to move over long road distances without having to rely on heavy truck assets for in theater transport.¹¹⁷

Neither a tank nor infantry fighting vehicle, the ASV-150 has the potential to successfully fill a void in the army's combat vehicle inventory. While its primary role will be to serve as a combat vehicle in a wartime environment, the Military Police Corps acknowledges that the ASV-150 will also be used in foreign internal development, disaster relief, and nation

assistance missions.¹¹⁸

V. Analysis of the Unique Characteristics of Wheeled Light Armored Vehicles in Peace Operations

The light, wheeled armored vehicle offers many advantages over tracked vehicles. Since peace operations are fundamentally different from high intensity operations, many features that make tracked vehicles the optimal weapons system in other forms of conflict may actually be disadvantages in peace operations. Overall, today's light, wheeled armored vehicles are highly effective weapons systems. As one defense analyst noted:

The tank's perceived advantages actually become handicaps when translated into low mobility, vulnerability, heavy maintenance and high operating costs. These considerations have led to the emergence of the wheeled armored vehicles, which, as a result of recent advantages in automotive technology, weaponry, fire control systems and cost effectiveness . . . enjoy the status of full fledged combat vehicles.¹¹⁹

Thus, using the criteria of mobility, protection, and firepower, this section will determine what unique advantages the light, wheeled armored vehicle offers the peacekeeping force.

Mobility

Traditionally, the utility of wheeled armored vehicles was thought to be limited to paved roadways. As one French general noted, wheeled vehicles are especially well suited to exploiting areas "which have a highway infrastructure."¹²⁰ While light, wheeled armored vehicles do offer rapid long distance travel at relatively low cost, their utility is not limited to paved roadways.¹²¹ Recent operations prove that wheeled vehicles offer superior mobility in areas with a limited highway infrastructure.

Peacekeeping missions in Macedonia affirm that wheeled, light armored vehicles offer

superior mobility in areas with limited highway infrastructure. The U.S. task force's Quick Reaction Force, mounted in troop carrying HMMWVs, requires 2 1/2 hours of travel time to reach an observation post along the Serbian-Macedonian border. More time is required if the trip is made over the same mountain roads in M113 tracked personnel carriers. Using a light, wheeled armored vehicle such as the Finnish SISU or a LAV-25, a ten-man squad could arrive in position in the same time it would take the HMMWV squad. However, troops arriving in the SISU or LAV-25 would have the benefit of greater armor protection enroute, and greater firepower once they arrive on station.¹²² Furthermore, tracked armored vehicles have exhibited great difficulty moving along icy mountain roads such as those found in Macedonia. As one officer put it, they become "unstoppable sleds on ice and snow."¹²³ However, when equipped with snow chains, the wheeled Finnish SISU can operate safely over the same icy roads.¹²⁴

In Haiti, the 2d ACR capitalized on the armored HMMWV's superior tactical mobility. The agile HMMWV permitted commanders to quickly collapse patrols and move to areas where there was a need to quell disturbances or control crowds. As one 2d ACR officer observed, "The 2d ACR, configured with the armored HMMWV, was capable of providing an agile, mounted, patrolling force and the nucleus for a Quick Reaction Force."¹²⁵

Units participating in Operation Restore Hope in Somalia also realized that the situation called for a light, mobile force that was capable of long range operations in an austere environment. Again, wheeled vehicles were uniquely suited for operations in this environment. As one U.S. Army After Action Report noted "... wheeled vehicles were ideal for the situation in Somalia." It added that "For the extended distances units were required to operate over, tracked vehicles would have been inappropriate."¹²⁶

Besides speed and agility, light wheeled armored vehicles offer many other advantages when operating in a peacekeeping environment. For example, light, wheeled armored vehicles do not cause the same damage to roads as do tracked vehicles. Additionally, wheeled vehicles are quieter than tracked vehicles.¹²⁷ Furthermore, Australian tests reveal that wheeled armored vehicles are a superb choice for long distance convoying, because they produce only a small dust signature on unimproved roads.¹²⁸

The ability to efficiently convoy long distances over limited road networks is one of the wheeled, light armored vehicle's advantages. As operations in Bosnia demonstrate, peace operations can often confront the force with the requirement to move long distances from a port to an area of operations.

France has also recognized the unique capability of the wheeled armored vehicle. The French Army decided to equip its forces with more wheeled armored vehicles after a careful analysis of future operations in support of NATO. Recognizing that their forces would have to move over long distances in short periods to support future NATO missions, French leaders felt that wheeled vehicles could provide superior strategic mobility.¹²⁹ As a result of these findings, a significant portion of the French Army's armored vehicle fleet is wheeled.

Like the French, many nations now realize that, "It is now possible to design wheeled AFVs to carry virtually the same armament and armored protection, and offer a comparable tactical mobility, [to] most tracked armored fighting vehicles. . . ." ¹³⁰ Far more fuel efficient than tracked vehicles, these vehicles offer the peacekeeping force with a troop carrier and weapons platform capable of operating over long distances in austere, resource constrained environments.¹³¹

It is important to emphasize that wheeled armored vehicles often offer *off road* mobility comparable to tracked vehicles. As one study discovered, most light armored wheeled vehicles weighing less than 20 tons offered off road mobility comparable to that of tracked vehicles. Significantly, the study also noted that those weighing under 15 tons tended to outperform tracked vehicles of equivalent weight.¹³²

Significantly, the price of this mobility, when compared to tracked vehicles, is noteworthy. Some figures reveal that the LAV-25's availability rate is approximately 17% better than comparable tracked vehicles. Additionally, estimates put the LAV-25's operating costs at \$1.92 per mile, while a tracked APC's operating costs average \$14.50 per mile.¹³³

Recent peacekeeping operations show the need for forces optimized for rapid deployment. To meet this requirement, troop carriers and weapons platforms should be air deployable.¹³⁴ In recognizing the need for such air deployability in the mid 1980's, the U.S. Army established a 17.7 ton weight restriction for its planned Armored Gun System (AGS).¹³⁵ While many wheeled vehicles currently in service can meet this weight restriction, the proposed AGS cannot. As a result, the U.S. Army does not have a vehicle comparable to the LAV-25. Additionally, recent tests at Fort Bragg reveal that the wheeled LAV-25 can be air dropped from C141 cargo aircraft.¹³⁶ In general, these and other factors support the conclusion that scenarios requiring long range mobility and rapid intervention favor wheeled armored vehicles.¹³⁷ The U.S. Army best summarized the benefits of light, wheeled armored vehicles in contingency operations when it stated that

... a wheeled vehicle is the preferred alternative. Wheels reduce logistics impact relative to tracked vehicle alternatives. Approx 80% of anticipated contingency missions can be accomplished on improved paved roads ... A wheeled vehicle offers

flexibility in dealing with contingency missions worldwide.¹³⁸

Protection

A study of the protection light, wheeled armored vehicles offer must always consider threats in the area of operations. As previously stated, two of the most common threats in a low to mid intensity conflict are snipers and mines. A review of the past performance of wheeled armored vehicles reveals some provide an inadequate level of protection against artillery and mines; others offer adequate crew protection, but sacrifice deployability and mobility. Furthermore, while most tracked and wheeled armored vehicles furnish the force with a satisfactory level of protection against small arms fire, recent operations in Somalia suggest that wheeled armored vehicles offer a superior level of protection against mines. This section will analyze the threats encountered in peace operations, and the protection wheeled, light armored vehicles can provide the force engaged in such operations.

The wheeled armored vehicles currently in service in the U.S. armed forces give varying degrees of protection. The M1025/26 HMMWV, a wheeled, light armored vehicle used by the U.S. Army in past peacekeeping operations provides inadequate protection against small arms fire. The level of protection the HMMWV provides is far less than that found on many other wheeled armored vehicles in service around the world.¹³⁹ Operations in Somalia and other regions proved that the HMMWV's ability to protect its crew from small arms fire was minimal.¹⁴⁰

While the HMMWV lacked the ability to protect its crew against small arms fire, other wheeled, light armored vehicles in the U.S. inventory offer enhanced levels of protection. As

previously noted, the LAV-25 can protect its crew from both small arms fire and airbursts. Finally, the ASV-150 is capable of providing protection against small arms fire up to .50 caliber.¹⁴¹

While the U.S. Army does have several tracked armored vehicles capable of defeating small arms fire, peacekeepers pay an exorbitant price for that protection. For example, the M2A2 Bradley's applique armor protects its crew against projectiles up to 30mm. The cost for that protection is less speed and mobility, especially the ability to negotiate the road and bridge networks in many less developed areas of the world.¹⁴²

Perhaps the most significant benefit afforded by light, wheeled armored vehicles is in the area of mine protection. As the U.S. Army's Center for Army Lessons Learned (CALL) noted, "... wheeled vehicles have more potential for mine survivability than tracked ones."¹⁴³ The Canadian Land Forces, who use a variety of wheeled armored vehicles, observed that

... the entire AVGP family has proven to be remarkably mine proof as a by product of their boat shaped hull. Several of these vehicles including the Bison and Cougar variants have driven over modern, powerful AT mines such as the Belgian made PRBs and sustained only moderate damage to their wheel assemblies (no casualties). On the other hand, the effects of these same kind of mines on light tracked vehicles have in many cases been catastrophic.¹⁴⁴

A CALL newsletter points to the unique design of wheeled armored vehicles as the reason for superior protection against mines. As a mine detonates by contact with a wheel, the initial blast is absorbed by the large rubber mass. The blast is further deflected away from the crew by the outward sloping hull. Thus, the combination of the boat shaped hull, strong armor, and wheels makes it possible for these vehicles to "withstand the effects of a mine blast with little damage and crew casualties."¹⁴⁵

The facts are compelling. The unique design of wheeled armored vehicles affords the crew superior protection against small arms fire and mines.¹⁴⁶ Canadian peacekeepers in Somalia offer the following testimonial about the BISON LAV:

Early in the afternoon, SSM Sloan suddenly reported on the squadron net that his BISON APC had struck a mine on the corner of the track which the entire fighting echelon had passed over not an hour before. . . . It took most of the rest of the afternoon to clear a lane to the SSM's vehicle and recover the wreck . . . the Bison had proven its worth, having withstood the blast with only suspension damaged. . . . Luckily, neither crew member was seriously hurt.¹⁴⁷

Canadians peacekeepers in Somalia also offer this observation about the HMMWV's lack of crew protection:

. . . SHQ, supported by ODA 562, conducted numerous liaison trips to the various military headquarters. . . . It was on one such patrol at beginning of March that bad luck struck yet again when one of the American Hummers exploded an anti-tank mine about 8 km south of Balenbale. The driver, Sergeant Bob Deeks, who was the team's medical specialist, was mortally wounded when both of his legs were blown off.¹⁴⁸

Retrofit kits can help enhance the ability of some vehicles to withstand mine blasts; however, the gains would be marginal. Only the development of new vehicles, or the use of those with proven designs against mine blasts, can provide enhanced protection.¹⁴⁹

Firepower

As previously discussed in Chapter II, the use of force is far more restrictive in peace operations. While firepower still has a role in peace operations, it is clearly less than in conventional operations. The role of armored vehicles is far more passive because threats in peace operations cannot be neutralized simply by applying overwhelming firepower.¹⁵⁰ Dr.

Larry Cable, a noted expert in low intensity conflict, emphasizes that peacekeepers must avoid the use of "high firepower," along with the "heavy handed use of forces in security roles."¹⁵¹ The application of force must be restrained and focused. "Overwhelming firepower" may serve to escalate the overall level of violence in a region, rather than reduce it.

Canadian peacekeeping experiences in Bosnia confirm Dr. Cable's view. Peacekeepers avoided using the COUGAR's 76mm main gun to reduce collateral damage. The .50 caliber machine gun proved to be a superior weapon against the small arms fire they encountered in Bosnia.¹⁵²

Today's light, wheeled armored vehicles are capable of mounting a variety of weapons systems. Often functioning in the role of troop carrier, troops on-board usually carry an extensive array of small arms which supplement the vehicle's organic systems. Additionally, the protection and mobility afforded by wheeled armored vehicles provides peacekeepers with an opportunity to avoid decisive engagement, thus reducing the need to use heavier weapons.

Although the use of large caliber weapons should be avoided during most peacekeeping operations, events in Somalia demonstrate that it is sometimes necessary. Today's light wheeled armored vehicles can mount heavier weapons systems, thus making them suitable for a variety of operations. New developments in armor design, combined with improved suspension systems and low recoil guns, make the light wheeled armored vehicle an appropriate system for both low and mid intensity conflicts. Many such systems can remain in a 15-20 ton category.¹⁵³ As the South Africans demonstrated with the ROOIKAT, a wheeled armored vehicle can mount a 105mm gun, and retain the characteristic mobility and protection of this family of vehicles.

In an era of rapidly shrinking defense budgets, the choice of weapons available on light,

wheeled armored vehicles make them an attractive alternative. Today's armored systems must be flexible and able to meet the requirements of more than one type of mission. Wheeled armored vehicles provide this flexibility.

A proposed assault gun version of the LAV-25 is the LAV-105. This system would mount a soft recoil, auto loading 105mm main gun.¹⁵⁴ A weapon system such as the LAV-105 (or a ROOIKAT) provides a peacekeeping force commander with a system capable of dealing with belligerents with access to sophisticated weaponry (such as Bosnian-Serbs with access to T55/T62 tanks).

An analysis that considers mobility, protection, and firepower in judging the utility of light, wheeled armored vehicles for peacekeeping operations leads to a favorable conclusion. Additionally, they have what many call a "softer" political impact when used in a peacekeeping environment.¹⁵⁵ Peacekeeping operations, with their ultimate objective of establishing a safe and secure environment, occur in a political and psychological sphere far removed from conventional military operations. Use of an inappropriate weapons system in this environment can have political and psychological effects that are counterproductive.

Perhaps the best appraisal of the value of light, wheeled armored vehicles in peace operations comes from the U.S. Army's analysis of the U.S. Marines LAV-25. Commenting on the LAV-25's effectiveness in Somalia, the Army Forces (ARFOR) after action review noted

Some additional firepower and mobility could be added to infantry units with the addition of some wheeled light armored vehicles, similar to the Canadian Grizzly and Marine LAV. Not all light infantry need this capability, but LAVs that could be tasked organized to a unit for a specific mission or requirement would prove valuable in this environment. The protection, firepower, and psychological advantage gained from

a LAV type vehicle would be complimentary to the advantages of light infantry. LAVs have proved to be great for operations in MOUT environments as well as moving forces over long distance rapidly.¹⁵⁶

VI. CONCLUSIONS

In Some Principles of Maritime Strategy, Sir Julian Corbett noted that "Classes of ships which constitute a fleet are, or ought to be, the expression in material, of the strategic and tactical ideas that prevail at any given time, . . . they have varied not only with the ideas, but also with the material in vogue."¹⁵⁷ While the subject of this monograph has been wheeled, light armored vehicles, these comments are still appropriate. For example, today's prevailing *strategic and tactical ideas* require the U.S. Army to field a force that is deployable, flexible, and capable of operating in a wide variety of contingencies. A significant portion of these contingencies will be peace operations. Finally, the *material* available with which to equip an armed force in today's world now includes highly capable wheeled, light armored vehicles. As many nations have learned, light, wheeled armored vehicles are indeed capable of meeting the unique requirements posed by peace operations.

In peace operations, the enemy is not the warring parties, but rather, the conflict itself. The overarching goal of the force engaged in peace operations is to maintain a secure and stable environment to foster a negotiated settlement to the conflict. As noted in Chapter II, the application of force is severely restricted by a set of political, psychological, and military variables unique to the peace operations environment. In order to maintain a secure and stable environment, armed forces rely on non violent techniques such as patrols and checkpoints. While Corbett referred to exercising command in the maritime environment, today's armed forces engaged in peace operations seek to exercise *control*.¹⁵⁸ In peacekeeping, military forces exercise control, while in peace enforcement these forces must first secure control.

The cases presented in this monograph show military forces using wheeled, light armored vehicles to exercise control, and foster the essential secure and stable environment. In all phases of peacekeeping in Haiti and Macedonia, these vehicles demonstrated that they possess the optimal blend of firepower, mobility, and protection necessary to meet mission requirements. As one Marine lieutenant colonel noted:

Given our threat [in Haiti] and given where we were operating almost exclusively in a built up area there, and I don't mean to imply that tanks can't be used in a built up area, but I think they have limited utility given the threat and the built up area environment there at Cap-Haitien.¹⁵⁹

While the evidence presented in this monograph indicates that wheeled, light armored vehicles are capable of operating in peacekeeping missions without heavy tracked armor support, the same cannot be said about peace enforcement operations. While some wheeled, light armored vehicles possess the firepower needed to defeat any of the armored systems known to operate in the regions studied (as noted in Chapter III, the ROOIKAT AFV-105 is capable of defeating a T-62 tank), their level of protection against a main battle tank is poor. In a peace enforcement operation, control has not been secured, and the hostility level is far higher than found in a peacekeeping scenario. In such cases, a robust force, capable of defeating heavily armed main battle tanks is clearly a necessity. In both Bosnia and Somalia, only main battle tanks could counter the armor threat. As one Marine noted, "If I had been in Somalia, where they did more work out of sector in a non built-up area, believe me if I'd been in Somalia, I'd have wanted the M1 too."¹⁶⁰ In peace enforcement operations, the benefits of wheeled, light armored vehicles complement those of their more heavily protected tracked counterparts. While main battle tanks are best capable of securing control in a high armor threat environment, so can

wheeled, light armored vehicles help exercise control in a low threat environment.¹⁶¹

As the evidence presented in this monograph shows, wheeled, light armored vehicles are uniquely suited for peace operations. They are best suited for exercising control, and maintaining a secure and stable environment that helps facilitate long term peace. In peacekeeping operations, where both sides have agreed to the entry of a peacekeeping force, the risk to the force is normally from snipers, mines, and missiles. Vehicles such as the LAV-25, COUGAR, and ASV-150 are capable of effectively operating in such a threat environment. As evidence presented in Chapter V suggests, their ability to withstand mine blasts is often greater than that of light tracked vehicles. Furthermore, their mobility enables them to conduct patrols with minimal damage to infrastructure, while providing a sense of stability and control in regions they patrol. As Canadian peacekeepers in Bosnia noted

... one sector [was] patrolled by the Cougar armoured squadron. The concept of operations was to patrol the sector to provide visibility, provide a forum for the warring factions to agree to a ceasefire, and provide a climate of hope and security that would permit the people to regain some measure of normal life. . . .¹⁶²

IMPLICATIONS

Wheeled, light armored vehicles have a major role to play in future peace operations. In peacekeeping, they can comprise the preponderance of armored systems operating in a region. They can continually exercise control, with a small number of heavier systems available as a Quick Reaction Force (QRF) if an analysis of the situation indicates an armored threat beyond the capabilities of light armored systems. If a similar analysis of a peace enforcement operation should reveal a threat beyond the capabilities of wheeled armor, then heavier tracked systems

will undoubtedly be required to secure control. After control is secured, wheeled armored systems are capable of exercising control, with a reaction force of heavier armor available to apply force if the situation warrants.

For the U.S. Army, the soon to be fielded ASV-150 offers the opportunity to better tailor forces engaged in peace operations. Forces mounted in the ASV-150 can exercise control, relieving M1A1 and M2A2 equipped forces from conducting operations which can easily threaten stability. Just as Corbett envisaged cruisers relieving battleships of many of the duties associated with exercising command, peace operations provide an environment where the ASV-150 can relieve the M1A1 and M2A2 of a multitude of tasks associated with exercising control.¹⁶³

Future peace operations may require the army to review its distribution of the ASV-150. As the U.S. Army comes to fully appreciate the utility of the ASV-150 in peace operations, it may find that the relatively few Military Police units equipped with the ASV-150 will be tasked with a higher than usual number of deployments. Light cavalry units such as the 2d ACR, presently equipped with the M1025/26 HMMWV, may find vehicles such as the ASV-150 (or perhaps the LAV-25/105) provide them with greater capabilities in peace operations and LIC.

The wheeled, light armored vehicle provides the force engaged in peace operations with a capability that such operations demand. It is easily deployed by air or sea lift, capable of mobility in areas with reduced infrastructure, and provides a requisite level of force protection. Capable of mounting a variety of weapons systems, wheeled, light armored vehicles can provide the force with a level of firepower consistent with that normally required during peace operations. Finally, they provide the commander with a politically and psychologically

acceptable system, capable of exercising control without heightening emotions. Clearly, they are uniquely suited for peace operations.

ENDNOTES

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2. Kevin Benson, "Report From Haiti: Cavalry in Peacekeeping Operations." Armor 104 (November-December 1995): 15.
3. Madeleine Albright, Statement before the Subcommittee on Foreign Operations, Export Financing and Related Programs of the U.S. House of Representatives Appropriations Committee, U.S. Department of State Dispatch 5 (Washington D.C.: Office of Public Communications, 16 May, 1994): 315.
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5. Madeleine K. Albright, Statement before the Subcommittee on International Security, International Organizations, and Human Rights of the House Committee on Foreign Affairs, U.S. Department of State Dispatch 4 (Washington D.C.: Office of Public Communications, 24 June 1993): 468.
6. Department of the Army, Field Manual 100-1, The Army, (Washington D.C.: U.S. Government Printing Office, 1994), 27.
7. Ibid, 27.
8. Richard William Conroy, "Beyond Peacekeeping: Strategies of United Nations Peace-Enforcement in a Turbulent World" (Ph. D. diss., University of Notre Dame, 1994), 41.
9. R.M. Orgorkiewicz, "Tracked and Wheeled Light Armor Vehicles," International Defense Review 19, (August 1986): 9-16 and 52-62. Hereafter referred to as "Tracked and Wheeled Light Armor Vehicles."
10. Rod Paschall, LIC 2010, (London: Brassey's Defence Publications, 1990): 7.
11. Ibid, 7.
12. John G Roos, "Light Weight, Real Wallop: New Missions Drive Lighter Armor Requirements." Armed Forces Journal International 132 (May 1995): 52.
13. Glenn Davis, "Wheels for the Future: Should the U.S. Army Adopt an Armored Wheeled System?" (Advanced Military Studies Program Monograph, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, March 1990): 12-14.

14. Roos, 52
15. Michael Dewar, The British Army in Northern Ireland. (London: Arms and Armour Press, 1985), 197.
16. _____ "ASV-150 Gets Tough for the US Army Bid." Jane's Defense Weekly 4, (4 November 1995): 73. This article notes that many of the nations using wheeled, light armored vehicles commonly refer to them as armored security vehicles.
17. Department of the Army, Field Manual 100-23, Peace Operations, (Washington D.C.: U.S. Government Printing Office, December 1994), 4.
18. Ibid, 4.
19. Ibid, 4.
20. James W. Boyd, United Nations Peace Keeping Operations: A Military and Political Appraisal, (New York: Praeger Publishing, 1972), 87.
21. Conroy, 18.
22. Ibid, 18.
23. Department of the Army, "The Application of Peace Enforcement Operations at Brigade and Battalion," (Fort Benning, GA: U.S. Army Infantry School, 1995), 1. Hereafter referred to as "The Application of Peace Enforcement Operations at Brigade and Battalion."
24. Ibid, 1.
25. FM 100-23, 6.
26. Ibid, 6.
27. "The Application of Peace Enforcement Operations at Brigade and Battalion," 2.
28. United Nations, The Blue Helmets, (New York: United Nations, 1990), 5. Referring to its peacekeeping operations, the U.N. notes that they "fall short of the provisions of Chapter VII. . . which deal with enforcement. At the same time, they go beyond purely diplomatic means or those described in Chapter VI of the Charter." Probably the best example of a recent Chapter VII collective security action is the Gulf War.
29. Conroy, 92.
30. Ibid, 4.
31. Ibid, 188.

32. "The Application of Peace Enforcement Operations at Brigade and Battalion," 2-18.
33. Conroy, 100.
34. Ibid, 103.
35. Ibid, 44.
36. Ibid, 5.
37. Ibid, 181.
38. FM 100-23, 33.
39. Ibid, 4-6.
40. Ibid, 6-12.
41. Department of the Army, "Approved Operational Requirements Document (ORD) for the Armored Security Vehicle," (Fort Monroe: Headquarters, United States Army Training and Doctrine Command, 2 April 1992): B-2. Hereafter referred to as "Approved Operational Requirements Document (ORD) for the Armored Security Vehicle."
42. "The Application of Peace Enforcement Operations at Brigade and Battalion," 17.
43. Benson, 15.
44. Ibid, 15.
45. "The Application of Peace Enforcement Operations at Brigade and Battalion," 24. Collateral damage refers to the unintended effects of military action on noncombatants and/or their property.
46. "Approved Operational Requirements Document (ORD) for the Armored Security Vehicle," B-2.
47. Matthew D. Morton, "Balkan Report II: Off the Shelf Wheeled Armor Proves Its Worth in Macedonian Winter." Armor (July-August 1996): 7.
48. Wayne Meeusen, "Operation Joint Endeavor, Task Force Eagle," Military Police 19-96-1 (Summer 1996): 14.
49. Morton, 7.
50. "The Application of Peace Enforcement Operations at Brigade and Battalion," 6.

51. Larry Cable, "Getting Found in the Fog: The Nature of Interventionary Peace Operations," Small Wars and Insurgencies 7 (Spring 1996): 105.
52. R. S. Wlasichuk, "OAG Audit of Peacekeeping Operations," Letter to Mr. Pierre Hamel (27 September 1995), 2. LTC Wlasichuk commanded a Battle Group during Canada's OP CAVALIER 3 in Bosnia-Herzegovina. His unit, which consisted of two armored squadrons and one mechanized infantry squadron, was deployed in Bosnia-Herzegovina from May-October 1994. His observations concerning the drawbacks of both the 76mm gun and machine gun suggest the use of a medium caliber direct fire weapon. The M2A2 Bradley's 25mm gun may be an appropriate weapon in a such an environment. The 25mm gun is far more precise than a machine gun, yet it's effects are less than that of a 76mm gun.
53. "The Application of Peace Enforcement Operations at Brigade and Battalion," 6.
54. "Tracked and Wheeled Light Armor Vehicles," 34.
55. Sean M. Maloney, "Insights into Canadian Peacekeeping Doctrine," Military Review 2 (March-April 1996): 20.
56. "The Application of Peace Enforcement Operations at Brigade and Battalion," 6.
57. Dewar, 197.
58. FM 100-23, 16.
59. James B. Hollis and Lowery A. West, "Fighting Close Terrain Battles in the Year 2000," Armed Forces Journal International 126 (October 1988): 76.
60. Richard E. Simpkin, Race to the Swift: Thoughts on Twenty-First Century Warfare, (London: Brassey's Defence Publishers, 1985), 71.
61. "The Application of Peace Enforcement Operations at Brigade and Battalion," 7.
62. U.S. Army, "Joint Task Force- 180, XVIII Airborne Corps After Action Report: Operations," Center for Army Lessons Learned (CALL) Online Data Base, undated, 52.
63. Ibid, 52.
64. FM 100-23, 17.
65. Paul Beaver, ed., Jane's Sentinel: Regional Security Assessment, The Balkans (United Kingdom: Jane's Information Group, 1996), 45. The all weather road referred to runs from the coast at Ploce to Sarajevo.
66. Morton, 7.

67. Paul Beaver, ed., Jane's Sentinel: Regional Security Assessment, Central America and the Caribbean (United Kingdom: Jane's Information Group, 1996). 16.
68. M.D. Kampman, "Armour In Humanitarian Assistance Operations" Canadian Forces Armour Bulletin 27, (January 1994): 16.
69. R. M. Orgorkiewicz, ed., "Armouring Vehicles for Peacekeeping," International Defense Review 27 (February 1994): 33. Hereafter referred to as "Armouring Vehicles for Peacekeeping."
70. Ibid, 36.
71. Rick Stennett and Jim Walley, "Operations Other Than War, Peace Operations," Center for Army Lessons Learned (CALL) Newsletter 93-8 (December 1993): VI-3.
72. Rakiya Omar and Alex de Waal, "Operation Restore Hope: A Preliminary Assessment," on the Joint Electronic Library Peace Operations CD-ROM Ver 2, (Fort Monroe: Joint Warfighting Center, December 1995): 26.
73. U.S. Army, "Mine Awareness Tactics, Techniques, and Procedures," (Fort Leavenworth: Center for Army Lessons Learned, undated): 23. Hereafter referred to as "Mine Awareness Tactics, Techniques, and Procedures."
74. "The Application of Peace Enforcement Operations at Brigade and Battalion," 24.
75. "Mine Awareness Tactics, Techniques, and Procedures," 24.
76. Ibid, 23.
77. Ibid, 24.
78. Ibid, 24.
79. Ibid, 27.
80. Cable, 108.
81. Terry J. Chandler and Christopher F. Foss, ed., Jane's Military Vehicles and Logistics, Sixteenth Edition, 1995-1996 (United Kingdom: Jane's Information Group Limited, 1995), 296.
82. Ibid, 269.
83. Ibid, 269.
84. _____, "Cougar Update," Canadian Forces Armour Update #9, (August 1978): 23.

85. Wlasichuk, 2.
86. Roos, John G. "US Army MPs About to Net Wheeled Armored Security Vehicles." Armed Forces Journal 130, (July 1993): 13-14. Hereafter referred to as "U.S. Army MPs About to Net Wheeled Armored Security Vehicles."
87. Timothy M. Laur and Steven L. Llanso, Encyclopedia of Modern U.S. Military Weapons. (New York: The Army Times Publishing Company, 1995), 220-221.
88. Ibid, 219-222.
89. Foss, 507.
90. Benson, 17.
91. U.S. Army, "Joint Task Force- 180, XVIII Airborne Corps After Action Report: Operations - Maneuver," 10.
92. "U.S. Army MPs About to Net Wheeled Armored Security Vehicles, 13.
93. "Approved Operational Requirements Document (ORD) for the Armored Security Vehicle," 4.
94. Laur, 198-199.
95. Christopher F. Foss, ed., Jane's Armour and Artillery, Sixteenth Edition, 1995-96. (United Kingdom: Jane's Information Group Limited, 1995): 271. Hereafter referred to as "Armour and Artillery."
96. Laur, 200.
97. Ramon Lopez, "USMC Rolls With LAV-105 Project: Army Seeks Replacement AGS," International Defense Review 24 (June 1996): 575.
98. "Armour and Artillery," 271.
99. Laur, 200.
100. U.S. Army, "The LAV-25 Airdrop Test," Video tape, (Fort Bragg, North Carolina: Fort Bragg Television System, January 1992). Hereafter referred to as "The LAV-25 Airdrop Test." Successful Low Altitude Parachute Extraction System (LAPES) drops were conducted by the 82d Airborne Division at Fort Bragg, North Carolina, from November through December 1991. The LAV-25s were airdropped from both C-130 and C-141. In all cases the LAV-25s were fully operational after the drops.

101. Jean T. Malone, "Armor in Military Operations Other Than War." (Masters of Military Arts and Sciences, United States Army Command and General Staff College, 1996), 95. The "psychological advantage" is a benefit that is frequently referred to when discussing the advantages of wheeled, light armored vehicles in peace operations. This and other cases suggest that forces mounted in wheeled, light armored vehicles can foster a feeling of security and stability through a restrained display of force. As already noted in this monograph, tracked armored vehicles can evoke strong (and often counterproductive) feelings in many individuals.
102. U.S. Army, "10th Mountain Division (LI), ARFOR After Action Report." Center for Army Lessons Learned (CALL) Online Data Base, (2 June 1993): 60.
103. "Armour and Artillery," 220-224.
104. Christopher F. Foss, "ARMSCOR's New Hit and Run Lynx," International Defense Review 22, (November 1989): 1565. Hereafter referred to as "ARMSCOR's New Hit and Run Lynx."
105. Willem Steenkamp, South Africa's Border War, 1986-1989, (Gibraltar: Ashanti Publishing, 1989), 46.
106. Ibid, 30.
107. "ARMSCOR's New Hit and Run Lynx," 1563.
108. Steenkamp, 196.
109. Conroy, 69.
110. South African Defense Force, "The Role of Light Armoured Fighting Vehicles in Modern Warfare," Armor Training Notes Issue 02, (March 1994): 2.
111. _____, "Contract Updates: Armored Security Vehicle." Army 46, (April 1996): 57.
112. Cross, Maureen W. "Armored Security Vehicle," Military Police (Summer, 1996): 7.
113. Ibid, 7.
114. _____, "ASV-150 gets tough for the US Army bid," Jane's Defense Weekly 4 (November 1995): 75.
115. "Approved Operational Requirements Document (ORD) for the Armored Security Vehicle," p. A-1.
116. Cross, 7.
117. _____, "ASV-150 gets tough for the US Army bid," 75.

118. Cross, 6.
119. Isaak Zulkarnen, "From the 'Red Kestrel' to the 'Red Cat' - South Africa's Rooikat 105 AFV," Asian Defence Journal 4 (April 1994): 42.
120. Andre Sciard, "Modern Use of Wheeled Vehicles," Armor 2 (March-April 1986): 32.
121. Ibid, 32.
122. Morton, 9. The SISU and LAV provide superb protection against small arms fire. Additionally, the LAV-25 mounts a 25mm gun. As previously noted, this weapon is well suited to use in both peacekeeping and peace enforcement operations. In contrast to the LAV-25, the HMMWV is normally equipped with either a machine gun or MK19 grenade machine gun. As Canadians operating in Bosnia discovered, both these systems can inflict a disproportionate amount of collateral damage.
123. Morton, 8.
124. Ibid, 8.
125. Benson, 15-16.
126. U.S. Army, "10th Mountain Div (LI), ARFOR After Action Report," 60.
127. Zulkarnen, 2.
128. John Reed, "The Current Status of the Wheeled Armoured Vehicle," Armada International 5 (September-October 1987): 52
129. Ian Bustin, "The Wheeled Alliance," Military Technology 10 (October 1994): 18.
130. Ibid, 19.
131. Zulkarnen, 42.
132. R.M. Orgorkiewicz, "Alternatives abound in automotive features," International Defense Review 22 (November 1989): 1569.
133. Reed, 53.
134. Boyd, 124.
135. Lopez, 576.
136. U.S. Army, "The LAV-25 Airdrop Test."

137. Bustin, 19.
138. "Approved Operational Requirements Document (ORD) for the Armored Security Vehicle," A-1.
139. _____ "ASV-150 gets tough for the US Army bid," 75
140. R.M. Orgorkiewicz, ed. "Armouring Vehicles for Peacekeeping," International Defense Review 27 (February 1994): 34. Hereafter referred to as "Armouring Vehicles for Peacekeeping."
141. TEXTRON corporation data sheet for ASV-150, undated.
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143. "CALL Mine Awareness Tactics, Techniques, and Procedures," 23.
144. Canadian Land Forces, "Mine Warfare in Peace Ops," Dispatches (1 April 1995):
145. "CALL Mine Awareness Tactics, Techniques, and Procedures," undated, 23.
146. "ARMSCOR's New Hit and Run Lynx," 1564..
147. Kampman, 16.
148. Ibid, 17.
149. "Armouring Vehicles for Peacekeeping," 35.
150. Ibid, 33.
151. Cable, 105.
152. Canadian Land Forces, Infantry Journal 27 (Winter 94) on Canadian Land Forces Lessons Learned CD-ROM, File Name PUB0045.
153. Sciard, 33.
154. Lopez, 575.
155. Zulkarnen, 42.
156. U.S. Army, "10th Mountain Div (LI), ARFOR After Action Report," 60.
157. Sir Julian Corbett, Some Principles of Maritime Strategy, (Annapolis: Naval Institute Press, 1988), 107.

158. Glenn Davis, "Wheels for the Future: Should the U.S. Army Adopt an Armored Wheeled System?," (School of Advanced Military Studies Monograph, United States Army Command and General Staff College, 1990), 1-9. The link to armored vehicles and Sir Julian Corbett was identified by Major Davis in this monograph. He noted that wheeled armored vehicles could exercise control by conducting missions such as reconnaissance, security, and combat operations. Utilized in such a manner, wheeled, light armored vehicles would support the efforts of main battle tanks. Davis maintained that wheeled armored vehicles would free main battle tanks for "more appropriate battlefield functions."

159. Tom Greenwood, quoted by Jean T. Malone, "Armor in Military Operations Other Than War," (Master of Military Science Thesis, United States Army Command and General Staff College, 1996), 83.

160. Ibid, 83.

161. Glenn Davis, 9. While Davis's focus was on exercising control in a LIC environment, events since 1990 demonstrate that hostilities in some peace enforcement operations (Somalia and Bosnia are excellent examples) can reach a level very similar to LIC. In both Somalia and Bosnia, media coverage showed numerous instances where belligerents had access to T-55 or T-62 tanks.

162. Canadian Land Forces, "ABCA Lessons Learned Newsletter 1," 16 May 1996, on The Lessons Learned Information Warehouse, (Fort Frontenac: Army Lessons Learned Center, February 1996).

163. Glenn Davis, 1-9. Peace operations confirm the complementary relationship between wheeled and tracked vehicles originally observed by Davis.

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